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THE WONDERS OF ARITHMETIC

OR

The Art of resolving, using only one figure, or by simple Addition, all rules of Interest or Discount, simple or complex, without having to divide, acquired in ten minutes study.

STOCK OPERATIONS,

The Four Rules proved by a simple Addition,
as quick as thought.

BY

J. M. DANIAUD.

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CHAPTER I.

Showing how all operations of Interest or Discount can be made without a Division.

If you want to find the interest on any sum, for one year, you shall multiply the capital by the rate, either simple or complex, that is with decimal fractions.

The rate is called simple when it is not followed by any fraction, as 1, 2, 3, 4, 5, 6, 7, 8, 9, etc.

The rate is called complex when it is followed by fractions, as 1.25, 1.75, 2.20, 2.25, 2.75, etc.

When you have multiplied the capital by a simple rate, you point off two decimals, by which you have divided by 100. The dollars stand to the left of the point and the cents to the right.

If you have a complex rate, you point off four decimals and the dollars stand to the left of the point, as above, and the cents to the right.

What is the interest on \$4842 at 6 o/o for one year ?

Example: \$4842
6 o/o

\$290.52 Answer: \$290.52 cents.

What is the discount on \$542 at 4 o/o for one year ?

Example: \$542
4 o/o

\$21.68 Answer: \$21.68 cents.

What is the interest on \$6424.10 at 5 o/o for one year ?

Example: \$6424.10
5 o/o

321.2050 Ans.: \$321.20 cts. 50 ou ½.

What is the interest on \$248 at 4½ o/o for one year ?

Example: \$248
4.50 o/o

12400
992

11.1600 Answer: \$11.16 cents.

\$23.223
8 070

1857.84 Answer: \$1857.84 cents.

How rules of Discount, simple or complex, can be made without a Division.

You add up all the figures of the capital, one after another, as many times as there are figures in it, beginning with the unit, that is to say starting from right to left, and you add the amount carried from each addition to the following figure to the left, as if every figure was the column of an addition.

What is the interest or discount on \$3422 at 4 070 for one day?

Example: \$3422.00

380221 Answer \$0.38 cents.

What is the interest on \$4242 at 4 070 for 21 days?

Example: \$4242.00

471332

21—days

471332

942664

9.897972

Answer: \$9.89 79 that I

will call as \$9.90, by leaving out the thousandths and adding a unit to the cents.

Proof by Division:

4242

4 070

16968

21—days

16968

33936

356328 | 360

3232

3528

9.898

2880

0000

Answer: 9.90 cents.

But as you find yourself with more than $\frac{1}{2}$ cent rest, you may add a unit to the cents and have the result: \$9.90 cents. This result is the same as by the other operation which is much shorter and in which you do not have to divide.

What is the interest on \$548.10 at 4 o/o for 4 days ?

Example: 54810.00
6089998
4—days

24.35.99.92 Answer: \$0.24 cents.
Proof by Division :

548.10
4 o/o
219240
4—days
876960 | 360
1569 |
1296 2436
2160
0000

Answer: \$0.24 cents.

2nd example :

What is the interest on \$4842 at 4 o/o for one day ?
4842.00
537998 Answer: \$0.54 cents.

You strike off, as before, the thousandths, and you add a unit to the cents.

Proof by Division :

4842
4 o/o
19368 | 360
1368 |
2880 53.8
0000

Answer: \$0.54 cents.

On the same capital at 4 o/o for 15 days :

Example: 4842.00

537998

15—days

2689990

537998

8.069970

Answer: \$8.07 cents.

Proof by Division:

4842

4 0/10

19368

15—days

96840

19368

290520 | 360

2520 |

0000

8.07 Answer: \$8.07 cents.

On the same capital at 6 0/10 for one day:

Example: 4842.00

537998

268999

8.06997

Answer: \$0.81 cents.

Proof by Division:

4842

6 0/10

29052 | 360

2520 |

0000

80.7 Answer: \$0.81 cents.

Same capital at 6 0/10 for 20 days.

Example: 4842.00

537998

268999

8.06997

20—jours

16.139940 Answer: \$16.14 cents.

— 7 —

Proof by Division: 4842
6 0/10

29052
20—days

581040 | 360
2210
504 16.14
1440

Ans. : \$16.14 cents.

Other proof by Division :

4842
20—days

96840 | 6
36
8 16.14
24

Answer : \$16.14 cents.

What is the interest on \$490 at 8 0/10 for 45 days ?

Example: 490.00

54443
108886
45—days

544430
435544

4.899870 Answer: \$4.90 cents.

Same capital at 5 0/10 for 120 days :

Example: 490.00

54443
27221
13610
5 0/10

68050
120—days

136100
68050

8.166000 Answer: \$8.17 cents.

Proof by Division:

490
8 070
<hr/>
3920
45—days
<hr/>

19600
15680
<hr/>

176400		360
3240		<hr/>
0000		4.90

Answer: \$4.90 cents.

Proof by Division:

490
5
<hr/>
2450
120
<hr/>

49000
2450
<hr/>

294000		360
600		<hr/>
2400		8.166
2400		
240		

Answer: 8.17 cents.

Two more examples:

Capital:—

6848.00

760886—4 070 interest for one day—

380443—2 070 " " "

190221—1 070 " " "

95110—1 070 " " "

47555—1 070 " " "

23777—1 070 " " "

Capital:—

20000.00

222222—4 070

111111—2 070

55555—1 070

27777—1 070

13888—1 070

69999—1 070

All these sums represent the interest for one day on the respective capitals of \$6848 or 20000.

This operation shows what is the result of adding up the capital, from right to left, as many times as there are figures in it.

You must always add two ciphers to the capital, that will reduce it to cents, and will give six decimals to the sum; these decimals should be pointed off, to get the dollars to the left and the cents to the right of the point.

In the example on 6848.00 which you add up from right to left the result is 760886; this sum represents the interest at 4 070 for one day; 380443 must then represent the interest at 2 070, as it is one half of the first; 190221 must represent 1 070.

In the example on 20000.00, there being only one

y Division:

360
 8.166
 3.17 cents.

.00
 22—4 0/10
 11—2 0/10
 55—1 0/10
 77—1 0/10
 88—1 0/10
 99—1 0/10

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figure, 2, you cannot do otherwise than to write 2 down under the ciphers and you have 2222222, for the interest at 4 0/10 for one day ; 11,11111 for the interest at 2 0/10, and so forth.

It follows that when you have added up all the figures of a capital sum, as many times as there are figures, and adding to the figure next following on the left hand the amount carried from each addition, the result will be the interest at 4 0/10 for one day, one half of such result will be the interest at 2 0/10, and so forth.

If then you want to find out the interest at 4 0/10 on \$20000 for 50 days, multiply the result of the addition from right to left of 20000 by 50 days and the product will give you the interest, after you have pointed off six decimals, the dollars standing to the left of the point and the cents to the right.

Example : \$20000.00
 50 jours 2222222 4 0/10 for one day

111.11110 Answer : \$111.11 cents.

The following is the way in which this adding up of the capital should be done to find out the interest at 4 0/10 for one day :

Suppose you have to add up the capital 4785. You begin by putting down the two necessary ciphers ; then you add up all the figures in the capital, one after another, taking care to add to the following figure to the left, the amount carried from each addition and the sum will give you the interest at 4 0/10 for one day.

Example : '4785,00
 531664—4 0/10 for one day

The sum 531664 has been obtained as follows : 5 and 8 are 13 and 7=20 and 4=24, I set down 4 and carry 2 which I add to the 5, I say : 2 and 5 are 7 and 8=15 and 7=22 and 4=26, I set down 6 and carry 2 which I add again to the 5 (so much for the two ciphers) and I say : 2 and 5 are 7 and 8=15 and 7=22 and 4=26, I set down 6 and carry 2 ; 2 carried and 8 are 10 and 7=17 and 4=21, I set down 1 and carry 2 ; 2 carried

and 7 are 9 and $4=13$, I set down 3 and carry 1; 1 carried and 4 are 5, I set down 5.

The sum of this addition of all the figures in the capital is: 531664, and this sum represents 4 o/o interest for one day on a capital of 4785, or \$0.53 and some thousandths.

It only remains to multiply by the number of days to find the interest wanted, if for more than one day.

I should be stated here that the thousandths must be included in multiplication of the addition by number of days.

You will therefore multiply 531664 by the number of days the capital has been bearing interest, because if you should multiply 53 cents only, the result for one day, there would be a large difference, if for a considerable number of days. It is therefore necessary to multiply the whole sum, whenever you have more than one day's interest.

FURTHER EXPLANATION OF THE ADDITION.

You must have noticed that in adding up the capital, it is necessary to go back three times to the last figure on account of the two cyphers following the capital. In the same manner when there are cyphers in the body of numbers, you must go back once more than the number of cyphers on the figure next following them on the left hand side.

Let us take as a capital to be added up the following: 200242, I will put down the two cyphers after the capital, and I will add up as before, but in going back three times on the figure 2 which is the last one of the capital, on account of the two cyphers by which it is followed.

And as to the two cyphers in the body of the number, following the figure 2, the first one of the capital, I add the figures 2, 2, 4, 2, which are 10, I set down 0 and carry 1; 1 carried and 2 are 3 and $2=5$ and $4=9$ and $2=11$, I set down 1 and carry 1; 1 carried and 2 are 3 and $2=5$ and $4=9$ and $2=11$, I set down 1 and carry 1; 1 carried and 2 are 3 and $2=5$ and

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2=5 and
1 carried
set down
2=5 and

4=9, I set down 9 and carry aught; I begin again with the 2 (the first figure of the capital) and I say: 2 and 2 are 4, I set down 4 and carry aught; as I have nothing more to add for the ciphers, I set down 2 for each of them and also for the first figure of the capital.

The sum of this addition is 22249110. And if I point off six decimals, I will have 22.24, which I will put down as \$22.25 cents interest for one day, leaving off the thousandths unless I should multiply by the number of days my capital has been bearing interest.

If I want to find out the interest at 6 0% on this capital which gave me as interest at 4 0% : 22249110, I shall take one half of that number, and add it up to the same, and that will give me the interest at 6 0% : it will then only be necessary to multiply by the number of days stated and having pointed off six decimals, I will have the \$ to the left and the cents and thousandths to the right of the point.

Example : 22249110—4 0%
11124555

33373665

70—days

2336.156550

Answer : \$2336.16 cents.

We have in this way, as the interest asked for \$2336.16 cents and some thousandths which are left off in the final result of the operations.

It is well to strike off the thousandths, and add one to the cents, (as I said before) because in the final result only cents need be accounted for.

The addition of the capital can be made in various ways; it can be made by putting down the capital five times echellons by respecting every figure, putting down five times that representing the units, five times that representing the tenths, five times that representing the hundredths, etc., etc.

The sum of the addition will every time represent the interest at 4 0% for one day.

What is the interest on \$845 at 4 o/o for 40 days ?

Example :

$$\begin{array}{r}
 845 \\
 845 \\
 845 \\
 845 \\
 845 \\
 \hline
 9388795 \text{—} 4 \text{ o/o for one day} \\
 40 \text{—days} \\
 \hline
 3.7555.18.00
 \end{array}$$

Answer : \$3.75.55 i. e. \$3.76 cents.

Other example by repeating the figures of the same capital on \$845 :

$$\begin{array}{r}
 55555 \\
 44444 \\
 88888 \\
 \hline
 9388795 \text{—} 4 \text{ o/o interest for one day} \\
 40 \text{—days} \\
 \hline
 3.75551800
 \end{array}$$

Answer : \$3.76 cents.

The result is the same for both operations. With both these methods, it is necessary to point off eight decimals in the sum, to have the \$ to the left and the cents to the right of the point. Here is the proof of the two preceeding rules by addition of the capital.

Example : \$ 845.00

$$\begin{array}{r}
 93887 \text{—} 4 \text{ o/o for one day} \\
 40 \text{—days} \\
 \hline
 3.755480
 \end{array}$$

Answer : \$3.76 cents.

for 40 days ?

Proof by division : 845

4 oyo

3380

40—days

135200 | 360

2720

2000 3.75

200

Answer : \$3.76 cents.

With the method of adding up the capital, the operations are considerably shorter ; and when you have acquired the habit of adding up the capital as we have just been doing, you will be able to calculate interest or discount as quick as thought.

We have seen that the operations can be made by adding up all the figures of the capital in order to find the interest at 4 oyo for one day. We propose now to show how the interest can be found for the number of days the capital has been bearing interest. If you multiply the capital by the number of days and if you add up the figures of the result, in the same way as above, you will have the interest for the number of days given.

Example of the preceeding rules ;

.845

40 days

Proof: 845.00

93887

40—days

33800

3.7554

Answer : \$3.76 cents. 3.755480

Answer : \$3.76

Other example with a capital of 3.241 at 4 oyo for 12 days :

3241

12—days

Proof: 3241.00

3601.10

12—days

6482

3241

720220

360110

38892 addition.

4.3210

Answer : \$4.32 cents.

4.321320

Answer : 4.32

day

of the same

or one day

\$3.76 cents.

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pital.

\$3.76 cents.

Proof by division :

$$\begin{array}{r}
 3241 \\
 4 \text{ o} / \text{o} \\
 \hline
 12964 \\
 12 \\
 \hline
 25928 \\
 12964 \\
 \hline
 155568 \mid 360 \\
 1156 \mid \hline
 768 \quad 4.32 \\
 48
 \end{array}$$

Answer : \$4.32 cents.

After the multiplication by the number of days, four decimals only require to be pointed off in the result, on account of the ciphers being omitted.

And if you will consider carefully the foregoing remark, you will find that it is not necessary to add the two ciphers, when the multiplication takes place before the addition.

Example :

$$\begin{array}{r}
 845 \\
 40 \text{ days} \\
 \hline
 33800 \\
 33800 \\
 33800 \\
 33800 \\
 33800 \\
 \hline
 3.75551800
 \end{array}$$

Answer : \$3.76 cents.

In the foregoing operation, the same result is arrived at. But with this last method, it is always necessary to point off eight decimals in order to have the \$ to the left and the cents to the right of the point.

Other example : 845
40 days

33800
00000
88888
33333
33333

3.75551800 Answer : \$3.76 cents.

The result remains the same, after pointing off eight decimals.

All these rules give the interest at 4 o/o ; and when the interest at 4 o/o on any capital is once arrived at, it is easy to get at every rate. Take one half of 4 o/o you have 2 o/o ; take one half of 2 o/o you have 1 o/o.

When you have the 1 o/o rate, you multiply by the rate given and then by the number of days ; and you get the interest asked for after pointing off four decimals, if you have not added the two ciphers.

Every time you add those two ciphers to the right of the capital, you must point off six decimals.

But if the rates are complex, you must point off two more decimals in the result.

If you want to operate on any rate of interest, you can do so by getting first the 1 o/o interest which is $\frac{1}{4}$ of the 4 o/o i. e. of the sum of the addition from right to left, which represents the 4 o/o rate.

Example : 3421.00 à 5 o/o for 21 days

380110
190055
95027
5 o/o

475135
21—days

475135
950270

9.977835 Answer : \$9.98 cents.

All rules can also be made in this way: multiply first the capital by the number of days, then by the rate; take $\frac{1}{4}$ of the result and add it up as many times as there are figures in it; point off four decimals in the sum and you will have the \$ to the left and the cents to the right of the point.

What is the interest on 8422 at 3 oyo for 48 days?

Example : 8422 Capital.
 48—days

$$\begin{array}{r}
 67376 \\
 33688 \\
 \hline
 404256 \\
 3 \text{ oyo} \\
 \hline
 1212768 \text{—total.} \\
 606384
 \end{array}$$

to be added up 303192— $\frac{1}{4}$ of the total,

33.6878 Answer : 33.69

Proof : 842200
 935776—4 oyo
 467888
 233944—unit or $\frac{1}{4}$
 3 oyo

$$\begin{array}{r}
 701832 \\
 48 \text{—days} \\
 \hline
 5614656 \\
 2807328 \\
 \hline
 33.687936
 \end{array}$$

Answer : 33.69

In this operation, the capital has been multiplied by the number of days, and then by rate; the result has been 1212768, $\frac{1}{4}$ of this sum is 303192; the addition from right to left of the figures of the last sum, furnishes, after the pointing off of four decimals, the amount 33.68.78. A unit is added to the cents and the thousandths left out.

ay : multiply
s, then by the
s many times
imals in the
and the cents

r 48 days?

Other example on the same capital.

8422
48

Other example :

8422
48

67376
33688

67376
37688

404256
3 070

404256
449171
224585
112292

1212768
1347517
673758

33.6877

33,6879 Answer : 33.69.

Answer : 33.69.

In this operation, the capital has been multiplied by the number of days ; then by the rate, and the result was a total sum of 1212768. This result has been added up from right to left, and the answer has been one fourth of the sum of this addition.

Proof by division :

8422
3 070
25266
48 days

202128
101064

1212768 | 360
1327
2476 33.688
3168
2880
0000

Answer : 33.69.

The rule to be followed as to the number of decimals to be pointed off is the following : For the capital, two, for the simple rate, two, for the two ciphers that follow the capital, two, and if the rate is complex, for the decimals in the rate, two, making all told eight decimals, if are combined in the operation all these conditions.

59
multiplied by
result has
addition
um, furn-
e amount
the thou-

Other method of operating by the unit.
 Example : 7424 at 7.50 for 50 days.

7424.00
 824887—4 o/o
 412443—2 o/o
 206221—1 o/o or unit.
 7.50

1031105
 1443547

154665750
 50—days

77.33287500

Answer : 77.32 cents.

All operations can be made with the unit, let the rate be complex or not.

The unit always represents 1 o/o interest for one day, if the capital has not been multiplied by number of days; but if on the contrary, the unit will represent 1 o/o interest for the number of days the capital has been multiplied by, and it will only be required to multiply by the rate.

We will give two examples of that below.

What is the interest on 743 at 5.25 for 43 days?

743.00
 82554
 41277
 20638—unit
 43—days

632300
 702554
 351277
 175638—unit
 9 o/o

61914
 82552

1580742
 22—days

887434
 5.25—rate

3161484
 3161484

4437170
 1774868
 4437170

34.776324
 Answer : 34.78 cents.

4.6590260

Answer : 4.66.

— 19 —

Proof by division : $\begin{array}{r} 743 \\ 5.25 \end{array}$

$\begin{array}{r} 3715 \\ 1486 \\ 3715 \end{array}$

$\begin{array}{r} 390075 \\ 43\text{—days} \end{array}$

$\begin{array}{r} 1170225 \\ 1580300 \end{array}$

$\begin{array}{r|l} 16773225 & 360 \\ 2373 & \\ \hline 2132 & 4.6592 \\ 3322 & \\ 825 & \\ 105 & \end{array}$

Answer : 4. 66.

Other examples :

What is the interest on 4842 at 4 o/o for one day ?

484200

Proof by division :

0.537998

4842

Answer : 0.54 cents.

4 o/o

$\begin{array}{r|l} 19369 & 360 \\ 1368 & \\ \hline 2880 & 538 \\ 0000 & \end{array}$

Answer : 0.54 cents.

Same capital at 4 o/o for 15 days :

Example : 4842.00

Proof by division :

537998

4842

15—days

4 o/o

$\begin{array}{r} 2689990 \\ 537998 \end{array}$

$\begin{array}{r} 19368 \\ 15\text{—days} \end{array}$

8.069970

96840

Answer : \$8.07 cents.

19368

290520

290520 | 360
 2520 |
 0000 8.07
 Answer : \$8.07 cents.

Same capital at 6 o/o for 20 days

Example : 484200

537998—4 o/o

268999—2 o/o

806997

20—days

16.139940

Answer : \$16.14 cents.

Proof by division.

4842

20—days

96840 | 6

36

8

16.14

24

Answer : 16.14 cents.

What is the interest on \$490 at 8 o/o for 45 days?

Example :

490.00

54443—4 o/o

108886—double or 8 o/o.

45—days

544430

435544

4.899870

Answer : \$4.90 cents.

Proof by division :

490

8 o/o

3920

45—days

19600

15680

176400 | 360

3240

0000

4.90

Answer : 4.90 cents.

Same capital at 5 o/o for 120 days.

Example : 490.00

54443

13610—unit or both together 5 o/o.

68053

120—days

1361060

68053

8.166360

Answer : \$8.17 cents.

Proof by division : 490

5 o/o

2450

120—days

4900

2450

294000 | 360

600

2400

8.166

2400

240

Answer : 8.17 cents.

What is the interest on 2333 a 5 o/o for 22 days?

Example :

2333.00

259221—4 o/o

129610—2 o/o

64805—1 o/o or unit,

5 o/o

324025

22—days

648050

648050

7.128550

Answer : \$7.13 cents.

Proof :

2333

5 o/o

11665

22—days

23330

23330

256630 | 360

463

1030

7.128

3100

220

Answer : \$7.13 cents.

What is the interest on 745 at 7 o/o for 15 days?

Example:		Proof:	
Making together	745.00	745	
	82776—4 o/o	7 o/o	
	41388—2 o/o		
	20694—1 o/o	5215	
		15—days	
	144858		
	15—days	26075	
		5215	
	724290		
	144858	78225 360	
		622	
	2172870	2625	2.17
		105	
Answer: 2.17 cents.		Ans.: 2.17 cents.	

Other example at 7 o/o for 20 days on a capital of 48948.20.

		Proof:	
Making together	48948.20.00	48948.20	
	543868885—4 o/o	7 o/o	
	271934442—2 o/o		
	135967221—1 o/o	34263740	
		20—days	
	951770548		
	20—days	685274800 360	
		3252	
	190.35410960	1274	190.3541
Answer: 190.35 cents.		1948	
		1480	
		400	
Ans.: \$190.35 cents.—40			

You may see that the result arrived at is always the same as with a division, and the operation is much shorter as it is easier and more convenient to add up and to multiply than to divide.

With this method you will save much time, because you won't have the trouble to find out how many times 360 is in any given number; and when you have acquired the habit of adding up the capital from right to left, you will be able to do all rules of interest or discount as quickly as you can write down the figures.

or 15 days?

RULE AT 6 o/o.

In all rules at 6 o/o, where the number of days is divisible by 6 without leaving a fraction, the capital may be multiplied by the figure obtained as quotient.

Example:—What is the interest on 745 at 6 o/o for 42 days?

$$\begin{array}{r} 745 \\ 7 \\ \hline \end{array}$$

5.215

Answer: 5.21

What is the interest on 4323 at 6 o/o for 48 days?

Example:

$$\begin{array}{r} 4323 \\ 48 \\ \hline \end{array}$$

34,584

Proof:

$$\begin{array}{r} 4323.00 \\ 480332 \\ 240166 \\ \hline 720498 \\ 48 \\ \hline 5763984 \\ 2881992 \\ \hline 34.583904 \end{array}$$

34.583904

Answer: 34.58

Proof by division:

$$\begin{array}{r} 745 \\ 6 \text{ o/o} \\ \hline \end{array}$$

$$\begin{array}{r} 4470 \\ 42\text{—days} \\ \hline \end{array}$$

$$\begin{array}{r} 8940 \\ 17880 \\ \hline 187740 \end{array} \quad \begin{array}{r} 360 \\ \hline 774 \end{array}$$

$$\begin{array}{r} 540 \\ 180 \end{array} \quad \begin{array}{r} 5.21 \\ \hline \end{array}$$

Answer: 5.21

$$\begin{array}{r} 745 \\ 2 \end{array} \quad \text{for 12 days}$$

1.490

Ans.: 1.49 cents.

Answer: 34.58

Proof:

$$\begin{array}{r} 745.00 \\ 82776 \\ 41388 \\ \hline 124164 \end{array}$$

$$\begin{array}{r} 124164 \\ 12\text{—days} \\ \hline \end{array}$$

$$\begin{array}{r} 248328 \\ 124164 \\ \hline \end{array}$$

1.489968

Answer: 1.49 cents.

By divisor 6.

$$\begin{array}{r} 745 \\ 42\text{—days} \\ \hline \end{array}$$

$$\begin{array}{r} 1490 \\ 2980 \\ \hline \end{array}$$

$$\begin{array}{r} 31290 \\ 12 \mid 6 \\ \hline 9 \quad 5.215 \\ 30 \end{array}$$

Answer: 5.21 cents.

s.: 2.17 cents.

on a capital of

proof:

8.20

7 o/o

740

20—days

800 | 360

190.3541

8

80

400

—40

is always the
tion is much
ent to add up

time, because
v many times
you have ac-
from right to
erest or dis-
the figures.

The same rule applies to the 4 o/o interest where the number of days is divisible by 9. Examples are given below.

It is clear that, as 42 divided by 6 gives 7, I multiply 745 by 7 and point off three decimals in the result in order to have the \$ to the left of the point and the cents to the right.

What is the interest on 745 at 4 o/o for 36 days?

Example: 745

4

2.980 Answer: 2.98

Other example at 4 o/o for 72 days on a capital of

3248

8

25.984 Answer: 25.98

Proof by addition of
the capital:

745.00

82776

36—days

496656

248328

2.979936

Answer: 2.98

Proof by division:

745

4 o/o

2980

36—days

17880

8940

107280 | 360

3528

2880

0000

2.98

Answer: 2.98 cents.

Rates can also be computed with the capital.

What is the interest on \$840 at 6 o/o for 70 days?

Example: 840—4 o/o }
420—2 o/o } giving together 6 o/o.

1260

70—days

88200—to be added up

9.7998

Answer: \$9.80 cents.

Proof by putting down the capital in echellons :

$ \begin{array}{r} 1260 \\ 1260 \\ 1260 \\ 1260 \\ 1260 \\ \hline 13999860 \\ 70\text{—days} \\ \hline 9.79990200 \end{array} $	<p>Proof: 840.00</p> $ \begin{array}{r} 93332\text{—}4\text{ o}\% \\ 46666\text{—}2\text{ o}\% \\ \hline 139998 \\ 70\text{—days} \\ \hline 9.799860 \\ \text{Answer: } 9.80 \end{array} $
<p>9.79990200 Answer : 9.80</p>	

Other example at 7 o/o on a capital of 840, for the same number of days :

$ \begin{array}{r} \text{Capital—}840\text{—}4\text{ o}\% \\ \text{Half—}420\text{—}2\text{ o}\% \\ \text{Quarter—}210\text{—}1\text{ o}\% \\ \hline 1470 \\ 70\text{—days} \\ \hline 102900\text{—to be added up} \\ 11.4332 \end{array} $	<p>} Together 7 o/o</p>
<p>11.4332 Answer : 11.43 cents.</p>	

Proof :

$ \begin{array}{r} 840.00 \\ 83332\text{—}4\text{ o}\% \\ 46666\text{—}2\text{ o}\% \\ 23333\text{—}1\text{ o}\% \\ \hline 163331 \\ 70\text{—days} \\ \hline 11.433170 \end{array} $	<p>} together 7 o/o</p>
<p>11.433170 Answer : 11.43 cents.</p>	

In the 6 o/o rule we have taken one half of 840, which we have added to the latter sum ; and we have multiplied the total 1260 by the number of days given, the result was 88200, we have added up the figures of this result as many times as there are figures in it ; we

have pointed off four decimals (as the two ciphers were not added), and we have had for an answer: 9.7998, that we called 9.80 leaving out the thousandths and adding one to the cents.

But we know that the addition can be made by putting down the capital in echellons in the manner we have indicated. This is tantamount to adding up from right to left the figures in the capital.

Some examples will be given here:

EXAMPLES BY ECHELLONS.

What is the interest on 840 at 7 o/o for 70 days?

$$\begin{array}{r}
 840-4 \text{ o/o} \\
 420-2 \text{ o/o} \\
 210-1 \text{ o/o}
 \end{array}
 \left. \vphantom{\begin{array}{r} 840-4 \text{ o/o} \\ 420-2 \text{ o/o} \\ 210-1 \text{ o/o} \end{array}} \right\} \text{together 7 o/o}$$

$$\begin{array}{r}
 1470 \\
 1470 \\
 1470 \\
 1470 \\
 1470
 \end{array}$$

$$\begin{array}{r}
 16333170 \\
 70\text{—days}
 \end{array}$$

11.43321900 Answer: 11.43 cents.

Other example:

Proof:

$ \begin{array}{r} 00000 \\ 77777 \\ 44444 \\ 11111 \end{array} $ <hr/> $ \begin{array}{r} 16333170 \\ 70\text{—days} \end{array} $ <hr/> <p>11.43321900</p>	$ \begin{array}{r} 840.00 \\ 93332-4 \text{ o/o} \\ 46666-2 \text{ o/o} \\ 23333-1 \text{ o/o} \end{array} $ <hr/> $ \begin{array}{r} 163331 \\ 70\text{—days} \end{array} $ <hr/> <p>11.433170</p>
<p>Answer: 11.43</p>	<p>Answer: 11.43 cts.</p>

the two ciphers
for an answer:
the thousandths

can be made by
in the manner we
adding up from

for 70 days?

7 o/o

cents.

Proof:

0.00
3332—4 o/o
6666—2 o/o
3333—1 o/o

3331
70—days

170
wer: 11.43 cts.

Other proof:

840—Capital
70—days

58800—to be added up and struck off
65331—4 o/o
32665—2 o/o
16332—1 o/o

11.4328 Answer: 11.43 cents.

Other example at 8 o/o for 41 days on a capital of

42231.00

4692332

2—Multip. or doubling the sum

9384664

41—days

9384664

37538656

384.771224 Answer: 384.771224

Proof by division:

42231

8 o/o

337848

41—days

337848

1751392

13851768

3051

1717

2776

2568

48

360

384.77

Answer: 384.77 cents.

In all these rules by putting down the capital by echellons it is necessary to point off eight decimals in order to have the \$ to the left of the point and the cents to the right.

OPERATION BY ONE FIGURE ONLY.

All operations can be made by one figure only, either with the addition or with the division.

What is the interest on 840 at 4 o/o for 70 days ?

Example : 840
 7—regulating figure

 5880—sum to be struck off
 6531—addition
 1680 —double capital

 23331
 4 o/o rate

 93324
 70—days

 6.532680

Answer : 6.53 cents.

Other example à 8 o/o on the same capital for 50 days.

 840
 7—regulating figure

 5880—sum to be struck off
 6531—addition
 1680 —double capital

 23331—unit
 50—days

 1166550
 8 o/o rate

 9.332400

Answer : 9.33 cents.

Pro

Proof

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 for 82 d

Proof by addition :

840
70—days

58800
6.5331

Answer : 6.53 cents.

Proof by addition of the figures in the capital, at 8 oyo

840.00
93332
186664
50 days

9.333200

Answer : 9.33 cents.

Other proof :

840
50—days

42000
4.6666—4 oyo.
2

9.3332—8 oyo.

Answer : 9.33 cents.

We call the figure 7, regulating figure, because it can be made use of in all operations. In fact, it furnishes the unit, in this way: the capital is multiplied by 7; the result of this is added up as many times as there are figures in it, as we have done before; then the capital is multiplied by 2, and the result put down under the sum of the previous addition, beginning under the tenths. The total on which the addition has been made and which is the result of the multiplication by 7 is then struck off, and the sum of the addition is added to the result of the multiplication of the capital by 2 or double capital.

It is always necessary in these operations to point off eight decimals in order to have the \$ to the left of the point and the cents to the right.

Other example on the same capital of 840 at 5.25 oyo for 82 days :

840
 7—regulating figure

 5880—to be struck off
 6531—addition
 1680 —double capital.

 23331—unit
 5.25—rate

 116655
 46662
 116655

 12248775
 82—days

 24497550
 97990200

 10.04399550

Answer : 10.04 cents.

PROOF.

84000	840
93332—4 o/o	5.25
46666—2 o/o	
23333—1 o/o	4200
5.25—rate	1680
	4200
<hr/> 116665	<hr/> 441000
46666	
116665	82—days
<hr/> 12249825	<hr/> 882000
82—days	3528000
<hr/> 24499650	<hr/> 36162000 360
97998600	1620
<hr/> 10.04485650	180 10.04

Answer : 10.04 cents.

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38

6.18

Réponse

The 6

We must here point off eight decimals on account of the two decimals on the rate with this method.

Nota. — Whenever the rate is simple, six decimals are pointed off, and eight decimals whenever the rate is complex.

As the rule at 6 o/o is of the most frequent occurrence with traders, I will give some more examples of it.

What is the interest on 4800 at 6 o/o for 50 days ?

Example :	4800.00	
	533332—4 o/o	
	266666—2 o/o	
	799998	
	50—days	
	39,999900	Answer : \$39.99.

Which we will call \$40, leaving out the thousandths and adding one to the cents.

What is the interest on 2323 at 6 o/o for 16 days ?

Example :	232300	Proof :	2323—capital.
	258110—4 o/o		16—days
	129050—2 o/o		
	387160		13938
	16—days		2323
	2322960		37168—to be added up
	387160		41295—4 o/o
			20647—2 o/o
	6.194560		6.1942

Réponse : \$6.19 cents.

Answer : 6.19.

The 6 o/o rule can be made in the following manner :

Example : On a capital of 840 for 82 days.

840
6—o/o
—
5040—to be struck off
5599—addition
840 —capital
—
13999
82—days
—
27998
111992

Proof by division :

840
82—days
—
1680
6720
—
68880 6
8
28
48

Answer : 11.48 cents.

1147918 Answer : 11.48 cents.

The operation has been done this way: the capital has been multiplied by 6, the result was 5040, this latter sum we have added up as many times as there are figures in it; the sum was 5599, under this we have put down the capital, beginning under the tenths, as we have seen done with the regulating figure 7, with this difference that this time we do not double the capital; then we have multiplied by the number of days given and we have pointed off five decimals (this is a general rule for this method).

The same rule by the divisor 7 is given below :

Example : 840

7
—
5880
6531
1680
—
23331
6 o/o
—
139986
82
—
279972
1119888
—
11.478752

Proof : 840

932—4 o/o
466—2 o/o
—
1398
82—days
—
2796
11184
—
11,4636

Answer : 11.46 cents.

Answer : 11.48 cents.

With this kind of proof, it would be necessary to add one to the sum of the addition from right to left, in order to get at the same result. Some examples are given below.

What is the interest on 450 at 6 o/o for 50 days ?

Example :

$$\begin{array}{r}
 450 \\
 \underline{7} \\
 3150 \\
 3499 \\
 900 \text{ —double capital} \\
 \hline
 12499 \\
 \quad 6 \text{ o/o} \\
 \hline
 74994 \\
 \quad 50 \text{ —days} \\
 \hline
 3.749700
 \end{array}$$

Proof:

$$\begin{array}{r}
 450 \\
 499 \text{ —} 4 \text{ o/o} \\
 \hline
 500 \\
 250 \\
 \hline
 750 \\
 50 \\
 \hline
 3.7500
 \end{array}$$

Answer : 3.75 cents.

3.749700

Answer : 3.75 cents.

For the *modus operandi* see first rule by the divisor 7.

In the proof, the addition has been made from right to left and one added ; I had in this way 500, as the 4 o/o and 250, as 2 o/o interest which gives 750 ; I multiply 750 by 50, and I have for an answer 3.75.

The following rule is generally used by accountants ; it is to find out the 6 o/o interest for 60 days on any capital, by pointing off two decimals.

What is the interest on \$450 for 60 days at 6 o/o.

Answer : 4.50 cents.

Proof by division :

$$\begin{array}{r}
 450 \\
 \underline{60} \\
 27000 \\
 30 \mid 6 \\
 \hline
 4.500
 \end{array}$$

Answer : 4.50 cents.

Other proof : 45000
 49999
 24999

74998
 60

4.499880

Answer : 4.50 cents.

What is the interest on 450 at 4 oyo for 90 days ?

Answer : 4.50 cents.

Proof by division : 450
 90

40500 | 9
 45 |
 4.500

Answer : 4.50 cents.

This, as you may see, gives a correct answer, but these two last rules, by pointing off two decimals, can only be applied to interest for 60 or 90 days. When the interest at 6 oyo for 60 days is found, you may easily find it for 30 days, for 15, for 7½, etc. If for more than 60 days, you may add the 7½, 15, or 30 days interest, etc.

In the 6 oyo and 4 oyo rules, three decimals are pointed off, because a cipher is left out in the divisor; it should be 60 or 90 instead of 6 or 9; to equalize the matter it should be necessary to strike off one figure in the dividend, if this has not been done, there is one decimal more in the quotient, three instead of two.

It follows that the capital had better be multiplied by the number of days, and divided by 6, if it is at 6 oyo, or divided by 9, if it is at 4 oyo.

This last method may be applied to any number of days.

If the capital is divided before the multiplication by the number of days, we shall follow the division up to three decimals; and after the multiplication by the

imals in or-
to the right

50 days ?

45000

49999

50

2.499950

2.50 cents.

50 days ?

555500

617220

80

49.377600

: 49.38 cts.

addition.

555

55

5

605

80

100

days ?

addition.

00

54

50

00

4.18 cts.

It will be seen from the proofs we have made of the preceeding rules, that the addition from right to left, is equivalent to division by 9.

Everybody knows that the general rule is to compute interest for a certain number of days; it is only by exception that it is computed for a month or for $\frac{1}{2}$ or $\frac{3}{4}$ of a year.

It is therefore necessary to use a division in order to make all operations of interest or discount.

With this system, division is abolished, and advantageously replaced by the addition from right to left; it is always easier and more convenient to add up than to divide.

CHAPTER II.

RULES FOR THE STOCK OPERATIONS MOST IN USE.

If the 5 o/o bonds are at \$75, what capital may be necessary to acquire an income of \$650 ?

Example: 650
2

1300

75

6500

9100

9750,0 Answer: 9750.

This operation is done by doubling the income wanted and then multiplying by the quotation.

One decimal is pointed off in the result, which is dividing by ten, and the \$ stand to the left and the cents to the right of the point.

Proof by the rule of three.

Example: $5 : 75 :: 650 : X$
75

$$\begin{array}{r} 75 \\ \hline 3250 \\ 4550 \end{array}$$
$$\begin{array}{r|l} 48750 & 5 \\ 37 & \hline 25 & 9750 \end{array}$$

•• Answer: 9750.

In this operation, the 650 income has been multiplied by the quotation, 75, and the result divided by 5; this means that as \$5 is the income derived from \$75, what capital is the \$650 to be derived from?

The above operation is made by the rule of three simple, and it reads thus :

5 is to 75 as 650 is to X.

We will now reverse the preceding rule and ask: if 75 give 5 per cent. income, how much will 9750 give?

Example: $75 : 5 :: 9750 : X$

$$\begin{array}{r} 48750 \quad | \quad 75 \\ 375 \quad | \quad \underline{\hspace{2cm}} \\ 000 \quad | \quad 650 : \end{array}$$

Answer: \$650.

If 75 yields 8, how much will 5625 yield ?

Example : $75 : 8 :: 5625 : X$
8

45000 | 75
000

600 **Ans. : 600.**

$$8 : 75 :: 600 : X$$
$$\begin{array}{r} 75 \\ \hline 3000 \\ 4200 \\ \hline 45000 \end{array}$$

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sum
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— 39 —

$$\begin{array}{r}
 45000 \mid 8 \\
 50 \mid \underline{\hspace{1cm}} \\
 20 \quad 5625 \\
 40 \\
 00 \quad \text{Answer: } 5625.
 \end{array}$$

PROOF OF THE FOUR RULES.

<p>Addition:</p> $ \begin{array}{r} 324-9 \\ 632-2 \\ 784-1 \\ \hline 1740-3-3 \end{array} $	<p>Subtraction:</p> $ \begin{array}{r} 84216-3 \\ 32214 \\ \hline 52002-3 \end{array} $
--	--

Multiplication:

$$\begin{array}{r}
 432-9 \\
 17-8 \\
 \hline
 3024-9 \\
 432 \\
 \hline
 7344-9
 \end{array}$$

Division=3=4787 | 34 = 7

$$\begin{array}{r}
 4787 \quad 270 \quad 14079=3 \\
 14 \quad 320 \\
 \hline
 4773 \quad 14
 \end{array}$$

PROOFS EXPLAINED.

To prove the addition, it is necessary to add up all the figures of every number once, and reduce each sum to one figure. The first number gives 9, as 9 is only one figure, we will put it down opposite the number. The second number is 632, which gives 11: we add up this two figures and have 2, which we put down opposite. The third number is 784, the figures added up give 19, we reduce to one figure and have 1, which we put opposite. The three figures 9, 2, 1 added up and reduced to one figure give 3. And the addition of all the figures in the sum, after reducing to one, must also give the figure 3.

This proof may also be made by adding up the figures of every number as if they were written in one horizontal line and forming but one number, passing over the figure 9 whenever it is found and reducing the sum to one figure.

The proof of the subtraction is made by adding up the minuend and reducing to one figure, as for addition, we have therefore 21, which reduced to one figure, gives 3. Then the subtrahend is added up with the remainder and we find again 21 which reduced to one figure, leaves again the same figure 3, the figure being the same the operation is proved to be correct.

In the multiplication, the multiplicand 432 is added up and gives 9, which is only one figure and needs no reducing; the multiplier is also added up and gives 8, I multiply by 8 and I have 72, I reduce to one figure and I have 9. The result of the multiplication is then added up and gives 18, which reduced to one figure gives 9, the two figures being equal, the operation is proved to be correct.

In the division, the dividend is added up and if there is a remainder it is deducted from the dividend.

Example 4/87, the remainder 14 deducted, we have 4773, add up once every figure in the latter number, you have 21, reduce to one figure, you have 3. Add up the divisor 34, you have 7, add up also the quotient 14079, you have 21, reduce to one figure, you have 3, multiply 7 by 3, you have 21, which reduced to one figure, gives 3.

The figure given by the dividend being the same as the one given by the multiplication of the two others numbers, the operation is correct.

It is not necessary to divide the sum of additions by divisor 9, to prove an addition : all that is wanted is to reduce to one figure, that being equivalent to the remainder after a division by number 9.

Example: add up every figures of 789654, you have 39, reduce to one figure, you have 3.

By division, if you divide 39 by 9, you have 4: 4 times 9 is 36, which deducted from 39, leaves 3.

Thus, without division, the same result is arrived at, and operations can be proved as quick as thought.

In adding up, the figure 9 may be passed over; that is to say, it is not necessary to add it up with the other figures.

MULTIPLICATION TABLE.

1	2...	3...	4...	5...	6...	7...	8...	9...	10
2	4...	6...	8...	10...	12...	14...	16...	18...	20
3	6...	9...	12...	15...	18...	21...	24...	27...	30
4	8...	12...	16...	20...	24...	28...	32...	36...	40
5	10...	15...	20...	25...	30...	35...	40...	45...	50
6	12...	18...	24...	30...	36...	42...	48...	54...	60
7	14...	21...	28...	35...	42...	49...	56...	63...	70
8	16...	24...	32...	40...	48...	56...	64...	72...	80
9	18...	27...	36...	45...	54...	63...	72...	81...	90
10	20...	35...	40...	50...	60...	70...	80...	90...	100

At 4 o/o Multiply the capital by the number of days, add up from right to left and point off four decimals.

At 5 o/o Multiply the capital by the number of days, add up from right to left, add one fourth.

At 6 o/o Multiply the capital by the number of days, add up from right to left, add one half.

At 7 o/o Multiply the capital by the number of days, add up from right to left, add one half and one fourth.

At 8 o/o Multiply the capital by the number of days, add up from right to left, multiply by 2.

At 9 o/o Multiply the capital by the number of days, add up from right to left, multiply by 2, add the unit.

At 10 o/o Multiply the capital by the number of days, add up from right to left, multiply by 2, add one half.

Ex.—250—4 o/o
30—days

7500
0,8332

At 5 o/o—250
30

7500
8332
2083

10415

At 6 o/o—250
30

7500
8332
4166

12498

At 7 o/o—250
30

7500
8332
4166
2083

14581

At 8 o/o—250
30

7500
8332
16664

At 9 o/o—250
30

7500
8332
16664
2083

18747

TABLE OF NUMBERS REPRESENTING THE RATES.

If you multiply the numbers representing the rates by the capital and then by the number of days, you will find the interest wanted, eight decimals should be pointed off in order to have the \$ to the left and the cents to the right of the point.

If there are fractions as $\frac{1}{2}$ $\frac{3}{4}$ $\frac{1}{4}$ to be added to the rate, add the corresponding number of these fractions to the simple rate.

If you want to find out interest at $2\frac{1}{2}$ o/o, take the number 5556, to which add 2430, in order to have the proper number for the multiplication by the capital and by the number of days, point off eight decimals and you have the interest wanted.

To find out interest at 10, 11, and 12 o/o, all you have to do is to double the number representing 5 o/o $5\frac{1}{2}$ o/o, etc.

THE SIGN 070 MEANS PER CENT.

<i>Rates.</i>	<i>numbers.</i>	<i>Rates.</i>	<i>numbers.</i>
$\frac{1}{2}$ 070.....	347	$4\frac{1}{2}$ 070.....	13194
$\frac{3}{4}$ 070.....	1041	5 070.....	13889
$\frac{1}{4}$ 070.....	694	$5\frac{1}{2}$ 070.....	14583
$\frac{1}{2}$ 070.....	1389	$5\frac{3}{4}$ 070.....	15277
$\frac{3}{4}$ 070.....	2083	$5\frac{1}{2}$ 070.....	15972
$\frac{1}{2}$ 070.....	2430	6 070.....	16667
$\frac{1}{4}$ 070.....	1736	$6\frac{1}{2}$ 070.....	17361
1 070.....	2778	$6\frac{3}{4}$ 070.....	18055
$1\frac{1}{4}$ 070.....	3472	$6\frac{1}{2}$ 070.....	18750
$1\frac{1}{2}$ 070.....	4166	7 070.....	19444
$1\frac{3}{4}$ 070.....	4861	$7\frac{1}{2}$ 070.....	20139
2 070.....	5556	$7\frac{3}{4}$ 070.....	20833
$2\frac{1}{4}$ 070.....	6250	$7\frac{1}{2}$ 070.....	21528
$2\frac{1}{2}$ 070.....	6944	8 070.....	22222
$2\frac{3}{4}$ 070.....	7639	$8\frac{1}{2}$ 070.....	22916
3 070.....	8333	$8\frac{3}{4}$ 070.....	23611
$3\frac{1}{4}$ 070.....	9028	$8\frac{1}{2}$ 070.....	24305
$3\frac{1}{2}$ 070.....	9722	9 070.....	25000
$3\frac{3}{4}$ 070.....	10416	$9\frac{1}{4}$ 070.....	25694
4 070.....	11111	$9\frac{1}{2}$ 070.....	26388
$4\frac{1}{4}$ 070.....	11805	$9\frac{3}{4}$ 070.....	27083
$4\frac{1}{2}$ 070.....	12500		

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